

REMARKS

Reexamination and reconsideration of the present application are requested.

Applicants have amended the drawings to overcome the Examiner's objections, and amended to specification to conform to the amended drawings. No new matter has been added. Applicants have also amended claims 2, 4 and 16. Accordingly, claims 1-19 remain pending in the application.

OBJECTIONS TO DRAWINGS

The Office Action objected to the drawings as allegedly not showing certain features of the invention. In particular, the Office Action objected that the following features were not shown in the Drawings: (1) "any output driver of the semiconductor device;" (2) "an address pin of the semiconductor device;" (3) "a pad of a data input/output pin;" and (4) "a second pad that is connected to a data input/output pin."

Regarding item 1, Applicants respectfully traverses this objection for at least the following reasons. Applicants respectfully submit that "any output driver of the semiconductor device" is not a "feature" of claim 1. Indeed, nothing in claim 1 requires that the semiconductor device even has an output driver. Rather, the feature of claim 1 is that "**the pad is not connected to any output driver of the semiconductor device.**" So, regardless of whether the semiconductor device has an output driver or does not have any output driver, the recited pad is definitely not connected to any output driver. To the extent that the nature of such a feature (i.e., the absence of a connection to an output driver that may or may not be present in the device) "admits of illustration by a drawing" (35 U.S.C. § 113), Applicants respectfully submit that FIG. 5 does as good a job as possible of illustrating it. FIG. 5 shows the pad (e.g., PAD1) and does not show it being connected to any output driver. How else could such a feature be shown? Accordingly, it is respectfully requested that this objection to the Drawings be withdrawn.

Regarding item 2, Applicants have amended claims 2 and 16 to delete specific

reference to the address pin. Accordingly, it is respectfully submitted that this objection to the Drawings has been overcome.

Regarding items 3 and 4, Applicants have revised FIG. 5 to indicate a PAD6 of a data input/output pin, as shown. Accordingly, it is respectfully submitted that this objection to the Drawings has been overcome.

35 U.S.C. § 112, FIRST PARAGRAPH

The Office Action rejected claims 1-19 under 35 U.S.C. § 112, first paragraph, as allegedly containing matter which was not described in the specification in such a way as to enable skilled in the art to make or use the invention. In particular, the Office Action states that “the structural connections” for: (1) “any output driver of the semiconductor device;” (2) “a pad of a data input/output pin;” and (3) “a second pad that is connected to a data input/output pin” are not shown in the drawings or described in detail the specification as to enable skilled in the art to make or use the invention.

Applicants respectfully traverse these rejections for at least the following reasons.

With respect to item 1, claim 1 recites that “the pad is not connected to any output driver of the semiconductor device.” Anyone - and not just those of ordinary skill in the art - but anyone at all would understand how to practice a feature of NOT connecting a pad to any output driver of a semiconductor device. It is just a matter of doing nothing to connect them! *Res Ipsa Loquitur*. This is discussed in the specification, for example, in paragraph [0031] on page 9, where it is explained that the pad may be an RQ pad which receives external addresses or commands, where the dummy output driver is substituted by the claimed apparatus for measuring electrical characteristics (i.e., there is no output driver connected to the pad).

With respect to items 2 and 3, claim 4 now recites “a second pad of the semiconductor device which is connected to a data input/output pin.” Once again, anyone - and not just those of ordinary skill in the art - but anyone at all would

understand how to connect a pad to a data input/output pin of a semiconductor device (e.g., by a bond wire). This is discussed in the specification, for example, in paragraph [0043] on page 9, where it is explained that:

“Also, the transistors in a transistor group 52 connected to the pads PAD1 through PAD5 of the semiconductor device may have the same size as an NMOS transistor connected to the pad PAD6 of a data input and/or output pin.”

Therefore, it is respectfully submitted that anyone - and not just those of “ordinary skill in the art” - would easily understand how to practice the above-mentioned features.

Accordingly, it is respectfully requested that the rejections of claims 1-19 under 35 U.S.C. § 112, first paragraph, be withdrawn.

35 U.S.C. § 112, SECOND PARAGRAPH

The Office Action rejected claims 1-19 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and claim the subject matter which applicant regards as his invention. In particular, the Office Action states that: (1) the “location” of the semiconductor device in claims 1, 4, 9 and 18-19 is unclear; (2) that the feature recited in claims 1, 9, 15 and 18-19 that “the pad is not connected to any output drive (sic) of the semiconductor device is unclear; and (3) it is unclear in claim 4 whether the “pad” of the semiconductor device is the same as the pad of the input/output pin.

Applicants respectfully traverse these rejections for at least the following reasons.

With respect to item 1, claim 1 recites an electrical characteristic measurer that is connected to the electrical element and a pad of the semiconductor device. What could possibly be “unclear” about that? The Office Action states that:

“According to FIG. 5 of the specification the semiconductor device or the electrical elements (TNV, TNI, TPV, TPI and RS) are located inside or are part of the electrical measurer 50.”

Why does the Office Action refer to “the semiconductor device or the electrical elements,” as if they are one and the same thing? These are two completely different things - as is extremely clearly recited in claim 1 and taught in the specification! The semiconductor device is a device made of a semiconductor material which includes the electrical characteristic measurer and the electrical element.

The semiconductor device is clearly not “located inside or part of” the electrical characteristic measurer.

Likewise, the electrical element is not “located inside or part of” the electrical characteristic measurer - and again, this is very clearly recited in claim 1 where it recites a “electrical characteristic measurer that is connected to the electrical element “ As for FIG. 5, one can clearly see that the various electrical elements are shown to be separate from the various measuring units 50, 60, etc. by the dashed lines. That is, FIG. 5 does not show that the element TNV is “located inside or part of” element 50 - indeed, it is shown by the dashed lines in FIG. 5 that it is not part of element 50. And this is 100% consistent with the teaching in the specification, for example, at paragraph [0033] of page 10, where it states that:

“An NMOS transistor TNV of a semiconductor device that is to be measured, is connected to the NMOS threshold voltage measuring unit 50.”

In any event, even assuming *arguendo* that what is claimed in claim 1 was somehow in conflict with what is shown in FIG. 5 (which it is not), that would still not make claim 1 “indefinite” and would not support any rejection under 35 U.S.C. §

112, second paragraph.

With respect to item 2, claim 1 recites that “the pad is not connected to any output driver (not “drive”) of the semiconductor device.” What could possibly be “unclear” about that? The Office Action states that:

“it is unclear where the ‘output drive’ (sic) is and what the ‘output drive’ (sic) stands for are not explained.”

Respectfully, Applicants ask what could possibly be unclear about an output driver? The specification teaches in paragraph [0031] that all DQ pads for receiving and outputting data include both an input receiver and an output driver. But RQ pads for receiving external addresses or commands include only an input receiver. So, in order to match input capacitance between DQ pads and RQ pads, normally a dummy output driver is provided for each RQ pad. In an embodiment of the present invention, however, the apparatus for measuring the electrical characteristics of a semiconductor device is substituted for the dummy output driver. As a result, the “pad is not connected to any output driver of the semiconductor device” - as is recited in claim 1. Certainly Stambaugh, cited by the Examiner, understood what an “output driver” is, as he shows an output driver 60 in FIG, 3 for driving bond pad 28 (see col. 4, lines 12-42), and specifically calls it an output driver at col. 5, line 55!

Finally, with respect to item 3, claim 4 now recites “a second pad of the semiconductor device which is connected to a data input/output pin.” Accordingly, it is respectfully submitted that this item has been overcome.

Accordingly, it is respectfully requested that the rejections of claims 1-19 under 35 U.S.C. § 112, second paragraph, be withdrawn.

35 U.S.C. § 103

The Office Action rejected: claims 1-3, 5-8 and 9-14 and 16 under 35 U.S.C. § 103 over Stambaugh et al. U.S. Patent No. 4,970,454 (“Stambaugh”) in view of

Roberts et al. U.S. Patent No. 5,743,661 (“Roberts”); claims 4, 18 and 19 under 35 U.S.C. § 103 over Stambaugh in view of Roohparvar U.S. Patent No. 6,275,961 (“Roohparvar”); and claims 15 and 17 under 35 U.S.C. § 103 over Stambaugh alone.

Applicants respectfully traverse those rejections for at least the following reasons.

Claim 1

Among other things, the apparatus of claim 1 features an electrical characteristic measurer that is connected to the electrical element and is driven in response to a control signal to output to a pad a value that is indicative of the electrical characteristics of the electrical element, wherein the pad is not connected to any output driver of the semiconductor device.

For example, as disclosed in the specification with respect to the embodiment of FIG. 5 of the present Specification, beneficially, the pad to which the electrical characteristic measurer is connected and to which it outputs the value that is indicative of the electrical characteristics of the electrical element, is an RQ PAD that is adapted to receive external addresses or commands (see page 9, paragraph 0031). Such a pad only includes an input receiver, and does not have an output driver since it is adapted to receive input signals, but not to transmit output signals.

In contrast, the pad 28 shown, for example, in FIG. 3 of Stambaugh is connected to a functional circuit 54 that includes an output driver 60. That is, the pad 28 of Stambaugh is connected to an input/output pin 36 (see col. 5, line 26; col. 3, lines 46-47) and therefore to an output driver.

The Office Action states that:

“it would have been obvious to one of ordinary skill in the art to understand that Stambaugh (sic) et al ('454)'s pad is not connected to any output driver of the semiconductor device since it is unknown what the 'output driver' stands for”

(emphasis in original).

At the outset, Applicants respectfully submit that one of ordinary skill in the art would absolutely know what an output driver is! Indeed, Stambaugh itself shows the output driver 60 in FIG. 3, specifically calls element 60 an “output driver” (col. 6, line 55), and discusses the output driver extensively in col. 4, lines 12-42.

Furthermore, Applicants respectfully ask how could it possibly be “obvious that Stambaugh (sic) et al ('454)'s pad is not connected to any output driver” when, as stated above, FIG. 3 very, very clearly shows that the pad 28 actually IS connected to the output driver 60?!?!? Respectfully, this makes no sense.

Also among other things, the apparatus of claim 1 features an electrical characteristic measurer that is connected to the electrical element and a pad of the semiconductor device, and that is driven in response to a control signal to output a value that is indicative of the electrical characteristics of the electrical element to the pad.

The Office Action cites FIGs. 3 and 6-9 of Stambaugh as allegedly showing the recited electrical characteristic measurer, citing circuits 40, 80, 94, 106 and 114.

With respect to FIG. 3, Stambaugh clearly teaches that the test circuit 40 includes the electrical element 24:

“The test circuit 40 this comprises a single transistor 24, . . . as well as circuitry 52 for isolating the test transistor 24 from the functional circuitry 54”

(emphasis added).

Therefore, the test circuit 40 of FIG. 3 clearly cannot be “connected to” the electrical element 24, since it includes the electrical element 24!

Meanwhile, perhaps the Examiner meant to state that the isolation circuit 52 corresponds to the recited electrical characteristic measurer. However, claim 1 recites that the electrical characteristic measurer is driven in response to a control signal to

output a value that is indicative of the electrical characteristics of the electrical element to the pad.” Meanwhile, Stambaugh teaches that it is the NMOS transistor 24 that outputs to the pad 28 a value indicative of its own electrical characteristics! For example, the N-channel transistor clearly is not connected to the pad 28, nor does it output any value to the pad 28. So it cannot correspond to the electrical characteristic measurer. Meanwhile, the P-channel transistor 42 and N-channel transistor 44 of the isolation circuit 52 serve to isolate the NMOS transistor 24 from the pad 28 during a normal operating mode, when the test mode is not enabled. The P-channel transistor 42 and N-channel transistor 44 do not output any value to the pad 28. So, the P-channel transistor 42 and N-channel transistor 44 cannot correspond to the electrical characteristic measurer, either.

A similar analysis holds with respect to the circuits of FIGs. 6-9.

Therefore, Stambaugh does not disclose or suggest any electrical characteristic measurer that is driven in response to a control signal to output a value that is indicative of the electrical characteristics of the electrical element to the pad.

The Office Action fails to state why Roberts was cited with respect to claim 1. In any event, it was not alleged in the Office Action that Roberts discloses any electrical characteristic measurer that is connected to the electrical element and a pad of the semiconductor device, and that is driven in response to a control signal to output a value that is indicative of the electrical characteristics of the electrical element to the pad.

Accordingly, for at least the foregoing reasons, Applicants respectfully request that the Examiner withdraw the rejection of claim 1 over Stambaugh and Roberts, and allow claim 1.

Claims 2-3 and 5-8

Claims 2-3 and 5-8 depend from claim 1 and are deemed to be allowable for at least that reason, and for the following reasons.

Claim 4

At the outset, Applicants fail to understand how claim 1 can be rejected

over Stambaugh in view of Roberts, while claim 4 - which depends from claim 1 - is rejected over Stambaugh in view of Roohparvar without any apparent need for Roberts. Applicant respectfully submits that if Roberts was needed by the Examiner for the rejection of claim 1, then it must also be required for the rejection of claim 4.

Meanwhile, among other things, in the apparatus of claim 4 the electrical characteristic measurer includes an NMOS transistor that is the same as a size as an NMOS transistor connected to a pad that is connected to a data input/output pin.

Applicants respectfully submit that no such feature is disclosed by Stambaugh, Roohparvar, or by any combination thereof. Indeed, it does not appear that the Examiner has cited Roohparvar for anything other than merely some NMOS transistor (of unspecified size) being connected to an input/output pin. This is not what is recited in claim 4.

Accordingly, no possible combination of Stambaugh and Roohparvar could produce the apparatus of claim 4 where an NMOS transistor of an electrical characteristic measurer is the same as a size as an NMOS transistor connected to a pad that is connected to a data input/output pin.

Accordingly, for at least these reasons, Applicants respectfully submit that claim 4 is clearly patentable over any possible combination of Stambaugh and Roohparvar.

Claim 9

Among other things, the apparatus of claim 9 features an electrical characteristic measurer, to which the electrical element is connected, that is driven responsive to the control signal to output to a first pad of the semiconductor device a value indicative of the electrical characteristics of the electrical element, wherein the first pad is not connected to any output driver of the semiconductor device.

Accordingly, for similar reasons to those set forth above with respect to claim 1, Applicants respectfully request that the Examiner withdraw the rejection of claim 1 over Stambaugh and Roberts, and allow claim 9.

Claims 10-14

Claims 10-14 and 16 depend from claim 9 and are deemed to be allowable for at least that reasons set forth above with respect to claim 9.

Claim 15

Among other things, the method of claim 15 includes connecting the electrical element of the semiconductor device to an electrical characteristic measurer, and driving the electrical characteristic measurer responsive to the control signal, to output a value indicative of the electrical characteristics of the electrical element to a first pad of the semiconductor device that is not connected to any output driver of the semiconductor device.

Accordingly, for similar reasons to those set forth above with respect to claim 1, Applicants respectfully request that the Examiner withdraw the rejection of claim 1 over Stambaugh and Roberts, and allow claim 15.

Claim 16

Claim 16 depends from claim 15. Applicants respectfully submit that Roberts fails to remedy the shortcomings of Stambaugh with respect to claim 15, as set forth above.

Accordingly, Applicants respectfully submit that claim 16 is patentable over Stambaugh in view of Roberts for at least the reasons set forth above with respect to claim 15.

Claim 17

Claim 17 depends from claim 15 and are deemed to be allowable for at least that reason.

Claims 18-19

Claim 18 depends from claim 9 and claim 19 depends from claim 15. Applicants respectfully submit that Roberts fails to remedy the shortcomings of Stambaugh with respect to claims 9 and 15, as set forth above.

Accordingly, Applicants respectfully submit that claims 18 and 19 are patentable over Stambaugh in view of Roohparvar for at least the reasons set forth above with respect to claims 9 and 15, and for the following additional reasons.

Among other things, the apparatus of claim 18 and the method of claim 19 each feature an electrical characteristic measurer having an NMOS transistor, a size of the NMOS transistor being the same as a size of an NMOS transistor connected to a second pad that is connected to a data input/output pin, wherein an output driver of the semiconductor device is connected to the second pad.

As explained above with respect to similar features in claim 4, the cited art does not disclose the two NMOS transistors having the same size.

Meanwhile, Applicants also note that claim 18 recites that the two NMOS transistors are connected to two different pads: (1) a first pad connected to an electrical characteristic measurer (the first pad is not connected to any output driver of the semiconductor device); and (2) a second pad of a data input/output pin (the second pad is connected to any output driver of the semiconductor device).

Accordingly, for at least these reasons, Applicants respectfully submit that claims 18-19 clearly define over the cited prior art.

CONCLUSION

In view of the foregoing explanations, Applicants respectfully request that the Examiner reconsider and reexamine the present application, allow claims 1-19, and pass the application to issue. In the event that there are any outstanding matters remaining in the present application, the Examiner is invited to contact Kenneth D. Springer (Reg. No. 39,843) at (703) 715-0870 to discuss these matters.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 50-0238 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17, particularly extension of time fees.

Respectfully submitted,

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FIG. 5

